LAUGHINGWATER CREEK BRIDGE
Mount Rainier National Park
Spanning Laughingwater Creek on East Side Road
Packwood Vicinity
Lewis County
Washington

HAER No. WA-55

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
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I. INTRODUCTION

Location:	Spanning Laughingwater Creek on the East Side Highway (Washington Highway 123), ½ mile south of Stevens Canyon entrance, Mount Rainier National Park, Lewis County, Washington. Quadrangle: Ohanapecosh Hot Springs, Wash. UTM: 10/610325/5178007
Date of Construction:	1935
Structure type:	Reinforced concrete continuous beam deck bridge
FHwA Structure No.:	9450-020P
Designer and Engineer:	Western Regional Office, Bureau of Public Roads, San Francisco, California Supervising Engineer: C. G. Polk Resident Engineer: W. D. Simpson
Contractor:	Joplin and Eldon, Portland, Oregon
Owner:	Mount Rainier National Park, National Park Service
Use:	Park highway bridge
Significance:	The longest continuous beam concrete girder bridge in the Northwest at the time of construction, Laughingwater Creek Bridge is one of only three historic exposed concrete spans in a park generally characterized by "rustic style" structures.
Project Information:	Documentation of Laughingwater Creek Bridge is part of the Mount Rainier National Park Roads and Bridges Recording Project, conducted in summer 1992 by the Historic American Engineering Record. Richard H. Quin, Historian, 1992

II. HISTORY

This is one in a series of reports prepared for the Mount Rainier National Park Roads and Bridges Recording Project. HAER No. WA-35, MOUNT RAINIER NATIONAL PARK ROADS AND BRIDGES, contains an overview history of the park roads. In addition, HAER No. WA-124, EAST SIDE HIGHWAY, contains more specific information on the road on which the structure is located.

East Side Highway

Constructed between 1931 and 1940, the East Side Highway provided the final link in a north-south route across the east side of the park. Surveys and construction of the road were administered by the Bureau of Public Roads (reorganized during the work as the Public Roads Administration, a division of the Federal Works Agency), although the National Park Service supervised all matters related to landscape engineering and retained final approval over all work.

The 13.8-mile road* leaves the Mather Memorial Parkway [HAER No. WA-125] at Cayuse Pass. The road drops along a steady grade for its first two and a half miles, in places carried out from the cliffs on stone retaining walls and benches. The bottom of the first grade is reached at Dewey and Deer Creeks, each of which is crossed at a sharp curve. Between them is a 507' tunnel, the only one encountered on the road. From Deer Creek, the road continues generally south-southwest, paralleling but keeping to the east side of Chinook Creek and, later, the Ohanapecosh River. Panther Creek is crossed on a replacement steel girder and reinforced concrete bridge about four miles south of Deer Creek. Two miles further south, the Stevens Canyon Road [HAER No. WA-123] leaves the road and continues east to Paradise and Longmire. The East Side Road continues south, crossing Laughingwater Creek on a continuous beam concrete girder bridge [HAER No. WA-55] before reaching the Ohanapecosh development. The road continues on another mile to the park boundary, and then another three miles to a junction with U.S. 12, the White Pass Highway. The East Side Road is now maintained by the State of Washington and is numbered as Washington Highway 123. The road is open seasonally from late spring until the advent of winter.

Laughingwater Creek Bridge

The East Side Highway (now Washington Highway 123) was designed to complete a circuit road around most of Mount Rainier. However, the planned extension of the West Side Road north to meet the Carbon River Road, and a road between Carbon River and Sunrise were never built, so the East Side Road forms only a segment of a half loop around the mountain.[1] Construction of the new highway in the early 1930s necessitated building a bridge over Laughingwater Creek, a tributary of the Ohanapecosh River. The crossing chosen was a site approximately one and half miles north northeast of the Ohanapecosh Hot Springs development. The construction of a temporary bridge was part of a clearing and grading contract assigned to the Colonial Construction Company in 1933.

Construction of the temporary bridge was assigned to a subcontractor, James Parks. The structure was nearly complete in July 1933 when it collapsed when a log beam was being pulled into place. Parks and several employees fell 75' with the wreckage; Parks died the next day in a hospital in Seattle.[2]

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* The mileage refers to the section of road within the park boundaries.

The temporary bridge was built to the west side of the planned center line to leave room for construction of the permanent span. This structure was a timber trestle with a roadway resting on timber stringers. Although dismantled after the new bridge was placed in service, its approaches remain visible to the southwest or downstream side of the present span. The span was washed away by flood waters in December 1933 and had to be reconstructed.[3]

Structural plans for the concrete bridge were prepared by the San Francisco Regional Office of the Bureau of Public Roads in 1934. Architectural plans for the bridge were prepared by the National Park Service and forwarded to the BPR's District Office in Portland, Oregon. The original plans called for a straight bridge over the creek; however, for reasons unknown, the BPR District Office protested this feature, and the bridge was altered to follow the curve of the road. Planning and design was completed in November 1934.[4]

The unique features of the three-span deck bridge is the long 122' center span of continuous beam construction. The 122' length was the longest concrete beam span yet constructed by the Bureau of Public Roads or the states of Oregon and Washington. The unusual length of the bridge was made possible by the unusually fine quality of concrete aggregate available, which provided for a very high working stress.[5]

The project was advertised in December 1934, and bids were opened on 4 January 1935. The contract was awarded to Joplin and Eldon of Portland, Oregon, who submitted the low bid of $54,355. The bid was formally accepted by the Secretary of the Interior on 8 February 1935 and the contract was signed on 26 February.[6]

Work began on 6 May 1935 with eighteen men under the supervision of construction foreman J. A. Wall. Excavation for pier #1 was completed on 25 May and excavation for pier #2 on 22 June. While the second pier was being excavated, the falsework for the support of the beam and deck forms was constructed. Special care was taken in the construction of the falsework because of the heavy weight of the massive longitudinal beams. Each piling would bear a load of from twelve to twenty tons. The contractor obtained timbers long enough not to require splicing of elements. Timbers 3" x 10" were used for sway bracing and 4"x10" for line bracing. All bents were sway and tower braced. The company also constructed gravel bunkers for the project and installed a gravel runway. By the end of June, the company had 32 men on the job and was roughly 40 percent complete.[7]

The first beam was poured on 6 August. To check for settlement and deflection, a line level was grouted into the north end of the bridge and used continuously for reference readings. The settlement of the beam was only 5/8" (as opposed to the 1" allowed in the plans), and the deflection at the center of the 122' beam was only 1/2" (where 1 1/4" had been allowed.) Each beam was poured in one continuous operation, working from both piers towards the center and ends simultaneously. Pouring of the deck was completed on 22 August and final concrete work on the rails and abutments was finished on 27 September.[8]

In order to lessen the glare from the large surface areas of new concrete, a decision was made to forego the usual rubbed finish and to sandblast the structure, followed by a staining with a copperas solution. The intent was to have the bridge blend in with the surrounding green and brown foliage. This phase of work was subcontracted to the West Coast Sand Blast Company of Seattle. The sand blasting removed the white surface glaze but had the disadvantage of emphasizing small surface defects. The bridge was then washed with acid and stained with a coat of copperas solution.[9] National Park Service resident landscape architect Ernest A. Davidson ordered a second coating, as the single coat did not sufficiently darken the bridge.[10]

Approach grading and cleanup was completed on 19 October and the resident engineer recommended acceptance of the bridge eight days ahead of the time allowed. Final cost of the structure was $54,542.93. Final inspection by the Park Superintendent was made on 27 October 1935 and the bridge was accepted.[11]

While the exposed concrete surfaces of the bridge are in contrast to the predominantly "rustic style" stone-veneered bridges found elsewhere in the park, the resident engineer suggested that the "sharp, massive lines of the bridge in elevation are in pleasing harmony with the massive lines of the towering cliffs so sharply outlined against the sky and forest foliage throughout the Park."[12]

By the 1950s, the structure was beginning to deteriorate. A 1954 report on the East Side Highway prepared by engineer J. F. Cameron of the Bureau of Public Roads described the bridge's structural problems:

> Laughing Water (sic) Creek Bridge was cleaned and painted two years ago on the inside and top of the handrails. This has improved the appearance, but it is apparent that chemical action internally is continuing on the aggregate. The outsides of the handrail and the faces of the barrel arch are covered with a dense, hard white material dripping from numerous minute cracks. It would be an expensive operation of doubtful value to attempt to scrape or sandblast this material and paint the surface in a manner similar to that used on the inside faces, and for that reason it has never been considered. No deterioration is observed under the arch barrel and this defect is following the usual pattern, that is, attacking exposed portions of the structure first. Eventually this rail will have to be rebuilt, but that appears many years in the future.[13]

A bridge safety inspection report prepared by the Washington State Department of Highways in May 1977 reported the general condition of the bridge as "sad." Very heavy leaching was apparent all over the bridge surfaces. In some places, cracks had leached through the concrete allowing water to leak through. The asphalt concrete was broken apart in several places. A 15' section of curb near the south end had been destroyed, and the rest was in poor condition. Most drains were plugged.[14]

More inspections by staff of the Washington Department of Transportation and the Federal Highway Administration in 1986 and 1987 convinced state officials that the bridge had to be replaced. The inspectors noted more extensive concrete deterioration in the form of leaching, exfoliation, and scaling. The structure's T-beams were observed to be cracked and heavily encrusted with leachate, and the structural section was failing due to the debonding of the reinforcing steel. These problems caused concern about the bridge's load-bearing capabilities. The officials estimated the cost of a replacement span at $1 million.[15]

In December 1989, the National Park Service announced plans to replace the Laughingwater Creek Bridge. The environmental assessment released that year cited a 1988 study conducted by the Federal Highway Administration which indicated that the structure was now deteriorating at an accelerated rate and was beyond the cost of feasible repair. A life of approximately two years was suggested. Although a catastrophic failure was not likely, the Washington State Department of Transportation and the NPS determined that it would be in the best public interest to replace the bridge. Failure to do so could eventually result in the loss of the structure and the closure of the road.[16]

Two main alternatives were offered in the environmental assessment. The "no-action" Alternative A would call for continued maintenance of the existing span and a suppression of the rate of deterioration. However, the bridge would still have to be replaced eventually. Alternative B called for its replacement with a new bridge just downstream of the old span and realignment of the two approaches. The new bridge would be of reinforced concrete construction with a stone veneer. The old bridge would be lessened in width to 20' during construction to allow traffic to continue using the road; it would then be removed and the old abutments and approaches revegetated and restored. The cost of the project was estimated at between $2.5 and $3 million in 1989 dollars. Other alternatives considered but later rejected included construction of a replacement upstream from the present span, construction of a new bridge on the existing site (requiring closure of the road), and reconstruction of the existing bridge.[17]

Proposed plans for the replacement bridge are for a steel and concrete beam bridge with stone masonry side walls in places. The structure will consist of three spans of 100', 160' and 100', resting on reinforced concrete piers. The general architectural design concept was adapted from the designs for the viaducts on the Stevens Canyon Road. These 1940s structures feature massive stone masonry guard walls on reinforced concrete substructures. Crossing these viaducts, the motorist is often unaware that he or she is passing over a road structure. For the new Laughingwater Creek Bridge, the stone side walls will extend well beyond the bridge abutments, providing a visual tie to the highway ribbon. Long tapers on both ends of the bridge should help smooth the transition from 20' roadway width to the 28' width of the proposed bridge. The masonry guard walls will "wrap" around the sides instead of merely resting on the sides of the deck.[18]

An alternative design provides for parallel parking for four to eight cars on the west side of the bridge and a pedestrian catwalk and overlook, cantilevered from the south bridge pier, offering a view of the creek valley. As this would encourage pedestrian activity on and around the highway bridge, some obvious safety considerations (as well as considerable additional expense) would be involved in this alternative.[19] As of this writing (August 1992), the alternative appears to have been rejected. Construction of the replacement span is tentatively scheduled for late 1992.

Description

Laughingwater Creek Bridge is a three-span continuous concrete girder bridge with a central span of 122' and 60' end spans. Total length of the structure is 238.88'; the roadway is 24' wide, providing for two traffic lanes. A 3' 6" sidewalk is located on the northeast side. Half-inch expansion joints are located at 25' centers. The deck rests on concrete piers and two battered concrete abutments. Abutment #1 (southwest) has a fixed, pintle-type bearing, while abutment #2 is a rocker-type expansion bearing. The bridge is built on a very slight grade of 1.258 percent.

Laughingwater Creek is a strong, perennial stream, which incidentally serves as the water source for the Ohanapecosh development in the southeast corner of the park. The bridge site is located in the lowland forest zone in an area with a string riparian vegetation association. The site is characterized by a mix of Douglas firs, alders, and vine-maple, intermixed with understory growth and wildflowers. Some trees in the area grow to immense dimensions, with diameters exceeding ten feet on some Douglas firs. Much of the surrounding area is considered old-growth forest; however, the bridge replacement projects were not expected to impact any large trees.[20]

III. ENDNOTES

1. W. D. Simpson, Assistant Highway Bridge Engineer, Bureau of Public Roads, "Final Construction Report (1935) on Laughing Water Creek Bridge, East Side Highway, Mt. Rainier National Park Project NR-5-A, Mt. Rainier National Park, Lewis County, State of Washington," 1935, 1. Federal Highway Administration files, transferred 1992 to Mount Rainier National Park Archives.

2. O. A. Tomlinson, Superintendent, Mount Rainier National Park, Superintendent's Annual Report, 1933, 10. MORA Archives, Box H2621, Superintendents' Annual Reports 1926-1932 file; Superintendent's Monthly Report, December 1933, 6. MORA Archives, Box H2615, Superintendents' Monthly Reports 1932-1935 file.

3. Simpson, 1; Tomlinson, Superintendent's Monthly Report, December 1933, 6. MORA Archives, Box H2621, Superintendents' Monthly Reports 1932-1935 file. See photographs 27074 and 27347 in the Simpson report for views of the temporary bridge.

4. Simpson, 1-2.

5. *Ibid.*, 2.

6. *Ibid.*.

7. *Ibid.*, 2-3; Tomlinson, Superintendent's Monthly Report, May 1935, 7; Superintendent's Monthly Report, June 1935, 11. MORA Archives, Box H2615, Superintendents' Monthly Reports 1932-1935 file.

8. Simpson, 3-4.

9. *Ibid.*, 4.

10. R. B. Wright, Senior Highway Bridge Engineer, Bureau of Public Roads, "Report on Laughingwater Creek Bridge, East Side Highway, Mt. Rainier National Park, 14 October 1935." Attached to *Ibid.* as Appendix 1.

11. Simpson, 4.

12. *Ibid.*, 5.

13. Quoted in Harlan D. Unrau, Historian, Denver Service Center, National Park Service, National Register of Historic Places nomination form for East Side Highway, Mount Rainier National Park, 19 January 1990, Sec. 8, p. 8.

14. Washington State Department of Highways, "Bridge Inspection Report, Bridge 040570, Laughing Water Creek," 18 May 1977.

15. U.S. Department of the Interior, National Park Service, National Register of Historic Places nomination for the East Side Highway, prepared by Harlan D. Unrau, Historian, NPS Denver Service Center, 19 January 1990, Sec. 8, p. 9.

16. U.S. Department of the Interior, National Park Service, Denver Service Center, "Environmental Assessment, Replace Laughingwater Creek Bridge" (Denver, CO: National Park Service, Denver Service Center, December 1989), 1.

17. *Ibid.*, 4-7.

18. "Preliminary Design Analysis, Laughingwater Creek Bridge Replacement, Mount Rainier National Park, Washington." Typed MSS, n.d. (1992), Engineering Office files, Mount Rainier National Park.

19. *Ibid.*.

20. Environmental Assessment, 14.

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